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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/044,402	01/11/2002	Olivier Menut	00-GR1-239	8917

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EXAMINER

BROCK II, PAUL E

ART UNIT	PAPER NUMBER
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2815

DATE MAILED: 01/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/044,402

Applicant(s)

MENUT ET AL

Examiner

Paul E Brock II

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UW

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 October 2003.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10, 15 and 17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10, 15 and 17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on 11 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____. 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 2, 4, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kircher et al. (USPAT 4942554, Kircher) in view of Jang et al. (USPAT 5637529, Jang).

With regard to claim 1, Kircher discloses a process for fabricating a semiconductor substrate with a single crystal lattice. Kircher discloses in figures 1 – 5 forming a substrate (1) with a single crystal lattice, the substrate having a top surface with at least one discontinuity in the single crystal lattice therein, whereby the top surface of the substrate has a recess (2) at the discontinuity on the top surface. Kircher discloses in figures 1 – 5 depositing a layer of amorphous material (8) having the same chemical composition as that of the substrate. Kircher discloses in figures 1 – 5 and column 4, lines 13 – 20 thermally annealing the amorphous material so as to be continuous with the single crystal lattice of the substrate. Kircher does not teach amorphizing the single crystal lattice around a periphery of the recess. Jang teaches in figure 1b amorphizing a single crystal lattice (31) around a periphery of a recess (39). It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the amorphizing of Jang in the method of Kircher in order to remove lattice defects, thereby

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improving yield and productivity of the semiconductor device as stated by Jang in column 1, lines 45 – 50.

With regard to claim 2, Kircher discloses in column 4, lines 6 and 7 planarizing the top surface of the substrate.

With regard to claim 4, Kircher discloses in column 3, line 44 wherein the step of forming the substrate includes forming the substrate with at least part of the material of silicon.

With regard to claim 17, Kircher and Jang disclose an integrated circuit comprising a silicon substrate with a single-crystal lattice, the substrate having a top surface with at least one discontinuity in the single-crystal lattice therein, whereby the top surface of the substrate has a recess at the discontinuity on the top surface and whereby the surface is treated in accordance with the process of claim 1.

3. Claims 3 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kircher and Jang as applied to claims 1 and 2 above, and further in view of one of ordinary skill in the art.

With regard to 3, Kircher teaches a step of planarizing in column 4, lines 6 and 7. Kircher does not teach how the planarization is accomplished. It is well known in the art wherein a step of planarizing a top surface includes planarizing the top surface by a chemical mechanical polishing. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use chemical mechanical polishing in the method of Kircher and Jang in order to reliably produce a planar substrate thus improving device yields and device performance.

With regard to claim 5, Jang teaches in column 2, lines 50 – 60 wherein the step of amorphizing includes amorphizing with a localized ion implantation around the recess by a masking operation.

4. Claims 6 – 10, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kircher and Jang as applied to claims 1 and 2 above, and further in view of Lill et al. (USPAT 6074954, Lill) and Numazawa et al. (USPAT 6168996, Numazawa).

With regard to claim 6, Kircher discloses in figures 1 – 5 wherein the step of forming a substrate include the sub-steps of etching a trench, and filling trench with a fill material so as to form the single-crystal lattice discontinuity. Kircher does not teach depositing first and second layers. Lill teaches in figures 3 – 13b depositing a first layer (6) of a first material and a second layer (8) of a second material in succession on a substrate (2), etching the first layer and an upper portion of a trench fill material (16) so as to form lateral cavities (22) in the second layer in communication with a trench (16) and so as to form the recess at a discontinuity (12). It would have been obvious to one of ordinary skill in the art to use the first and second layers of Lill in the method of Kircher and Jang in order to provide a mask for the etching of the trench as taught by Lill in column 10, line 56 – column 11, line 37. Kircher, Jang and Lill are silent to removing the second layer. Numazawa teaches in figures 21 and 22 removing a second layer (2b) it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the removing of Numazawa in the method of Kircher, Jang and Lill in order to expose underlying layers for the production of devices that will communicate with the trench.

With regard to claim 7, Kircher discloses in figure 2 wherein the sub-step of filling of the trench with fill material includes filling the trench with at least part of the fill material of a silicon oxide (4).

With regard to claim 8, Kircher discloses in figure 2 wherein the sub-step of filling of the trench with fill material includes filling at least part of the trench with an insulating fill material.

With regard to claim 9, Lill teaches in figure 4, and column 11, lines 51 – 62 wherein a sub-step of filling the trench is carried out by depositing silicon oxide (10) as a conformal coating. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the conformal coating of Lill in order to form a dielectric layer with a defect density low enough for improved performance of DRAM devices.

With regard to claim 10, Numazawa teaches in figure 19 wherein the sub-step of filling of the trench is carried out by thermal oxidation (5a) of the silicon. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the thermal oxidation of Numazawa in order to use an efficient and inexpensive means at filling the trench that is proven to form a reliable film.

With regard to claim 15, Jang teaches in figure 1b wherein the step of amorphizing includes amorphizing the single-crystal lattice around a periphery of the recess so as to be self-aligned with the trench.

Terminal Disclaimer

5. The terminal disclaimer filed on October 24, 2003 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of United States Patent number 6,537,873 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Response to Arguments

6. Applicant's arguments filed October 24, 2003 have been fully considered but they are not persuasive.

7. With regard to applicant's argument that "Kircher is silent on a 'substrate with a single crystal lattice' as well," it should be noted that the device of Kircher would not work without a "substrate with a single crystal lattice". Kircher specifically discloses in figure 1, lines 50 – 60 that the disclosed invention deals with VLSI circuits. As proof that this type of circuit only uses single crystal lattice type substrates, the first chapter in Wolf et al. has been provided. A careful review of this chapter reveals the necessity for single crystal substrates in the invention of Kircher. Therefore, applicant's arguments are not persuasive, and the rejection is proper.

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8. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., “*a layer of amorphous material having the same chemical composition as that of the substrate*” is deposited on the amorphized single crystal lattice”) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Therefore, applicant's arguments are not persuasive, and the rejection is proper.

9. With regard to applicant's arguments that “after the recrystallization of amorphous silicon layer 8, there is still the silicon oxide layer 7. Thus, the amorphous material [of Kircher] is not recrystallized ‘so as to be continuous with the single-crystal lattice of the initial substrate,’ which is the case as recited in the present invention,” [emphasis added] it should be noted that it is a property of the process that the layer 17 would be continuous with the single-crystal lattice of the initial single crystal substrate in the areas to the left and right of elements 4, 5 and 7. The claim language does not necessitate continuity across the entire boundary of the recrystallized layer. Therefore, applicant's arguments are not persuasive, and the rejection is proper.

10. With regard to applicant's argument that “the amorphization occur only in the bottom of the trench, and not around a periphery of the recess of the initial substrate,” it should be noted that the amorphization occurs around the periphery of the recess including the bottom of the trench in Jang. For example, the amorphized region 43 extends beyond a periphery of the recess.

The claim limitation does not limit the amorphization to the surface area of the substrate.

Therefore, applicant's arguments are not persuasive, and the rejection is proper.

11. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

12. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Conclusion

13. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

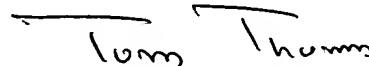
MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paul E Brock II whose telephone number is (703) 308-6236. The examiner can normally be reached on 8:30 AM - 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9306 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

Paul E Brock II
January 9, 2004



TOM THOMAS
SUPERVISORY PATENT EXAMINER